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SEQUENCE LISTING

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<120> PROCESS FOR THE PURIFICATION AND CRYSTALLIZATION OF
PROTEASOME

<130> 100564-09039

<140> 09/381,286

<141> 1999-12-07

<150> PCT/EP98/01653

<151> 1998-03-20

<150> EPO 97104877.2

<151> 1997-03-21

<160> 14

<170> PatentIn Ver. 2.1

<210> 1

<211> 203

<212> PRT

<213> Thermoplasma acidophilum

<400> 1

Thr Thr Thr Val Gly Ile Thr Leu Lys Asp Ala Val Ile Met Ala Thr
1 5 10 15

Glu Arg Arg Val Thr Met Glu Asn Phe Ile Met His Lys Asn Gly Lys
20 25 30

Lys Leu Phe Gln Ile Asp Thr Tyr Thr Gly Met Thr Ile Ala Gly Leu
35 40 45

Val Gly Asp Ala Gln Val Leu Val Arg Tyr Met Lys Ala Glu Leu Glu
50 55 60

Leu Tyr Arg Leu Gln Arg Arg Val Asn Met Pro Ile Glu Ala Val Ala
65 70 75 80

Thr Leu Leu Ser Asn Met Leu Asn Gln Val Lys Tyr Met Pro Tyr Met
85 90 95

Val Gln Leu Leu Val Gly Gly Ile Asp Thr Ala Pro His Val Phe Ser
100 105 110

Ile Asp Ala Ala Gly Gly Ser Val Glu Asp Ile Tyr Ala Ser Thr Gly
115 120 125

Ser Gly Ser Pro Phe Val Tyr Gly Val Leu Glu Ser Gln Tyr Ser Glu
130 135 140

Lys Met Thr Val Asp Glu Gly Val Asp Leu Val Ile Arg Ala Ile Ser
 145 150 155 160

Ala Ala Lys Gln Arg Asp Ser Ala Ser Gly Gly Met Ile Asp Val Ala
 165 170 175

Val Ile Thr Arg Lys Asp Gly Tyr Val Gln Leu Pro Thr Asp Gln Ile
 180 185 190

Glu Ser Arg Ile Arg Lys Leu Gly Leu Ile Leu
 195 200

<210> 2

<211> 205

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 2

Met Ser Asp Pro Ser Ser Ile Asn Gly Gly Ile Val Val Ala Met Thr
 1 5 10 15

Gly Lys Asp Cys Val Ala Ile Ala Cys Asp Leu Arg Leu Gly Ser Gln
 20 25 30

Ser Leu Gly Val Ser Asn Lys Phe Glu Lys Ile Phe His Tyr Gly His
 35 40 45

Val Phe Leu Gly Ile Thr Gly Leu Ala Thr Asp Val Thr Thr Leu Asn
 50 55 60

Glu Met Phe Arg Tyr Lys Thr Asn Leu Tyr Lys Leu Lys Glu Glu Arg
 65 70 75 80

Ala Ile Glu Pro Glu Thr Phe Thr Gln Leu Val Ser Ser Ser Leu Tyr
 85 90 95

Glu Arg Arg Phe Gly Pro Tyr Phe Val Gly Pro Val Val Ala Gly Ile
 100 105 110

Asn Ser Lys Ser Gly Lys Pro Phe Ile Ala Gly Phe Asp Leu Ile Gly
 115 120 125

Cys Ile Asp Glu Ala Lys Asp Phe Ile Val Ser Gly Thr Ala Ser Asp
 130 135 140

Gln Leu Phe Gly Met Cys Glu Ser Leu Tyr Glu Pro Asn Leu Glu Pro
 145 150 155 160

Glu Asp Leu Phe Glu Thr Ile Ser Gln Ala Leu Leu Asn Ala Ala Asp
 165 170 175

Arg Asp Ala Leu Ser Gly Trp Gly Ala Val Val Tyr Ile Ile Lys Lys
 180 185 190

Asp Glu Val Val Lys Arg Tyr Leu Lys Met Arg Gln Asp
 195 200 205

<210> 3
 <211> 198
 <212> PRT
 <213> *Saccharomyces cerevisiae*

<400> 3
 Met Asp Ile Ile Leu Gly Ile Arg Val Gln Asp Ser Val Ile Leu Ala
 1 5 10 15
 Ser Ser Lys Ala Val Thr Arg Gly Ile Ser Val Leu Lys Asp Ser Asp
 20 25 30
 Asp Lys Thr Arg Gln Leu Ser Pro His Thr Leu Met Ser Phe Ala Gly
 35 40 45
 Glu Ala Gly Asp Thr Val Gln Phe Ala Glu Tyr Ile Gln Ala Asn Ile
 50 55 60
 Gln Leu Tyr Ser Ile Arg Glu Asp Tyr Glu Leu Ser Pro Gln Ala Val
 65 70 75 80
 Ser Ser Phe Val Arg Gln Glu Leu Ala Lys Ser Ile Arg Ser Arg Arg
 85 90 95
 Pro Tyr Gln Val Asn Val Leu Ile Gly Gly Tyr Asp Lys Lys Lys Asn
 100 105 110
 Lys Pro Glu Leu Tyr Gln Ile Asp Tyr Leu Gly Thr Lys Val Glu Leu
 115 120 125
 Pro Tyr Gly Ala His Gly Tyr Ser Gly Phe Tyr Thr Phe Ser Leu Leu
 130 135 140
 Asp His His Tyr Arg Pro Asp Met Thr Thr Glu Glu Gly Leu Asp Leu
 145 150 155 160
 Leu Lys Leu Cys Val Gln Glu Leu Glu Lys Arg Met Pro Met Asp Phe
 165 170 175
 Lys Gly Val Ile Val Lys Ile Val Asp Lys Asp Gly Ile Arg Gln Val
 180 185 190
 Asp Asp Phe Gln Ala Gln
 195

<210> 4
 <211> 222
 <212> PRT
 <213> *Saccharomyces cerevisiae*

<400> 4
 Gln Phe Asn Pro Tyr Gly Asp Asn Gly Gly Thr Ile Leu Gly Ile Ala
 1 5 10 15
 Gly Glu Asp Phe Ala Val Leu Ala Gly Asp Thr Arg Asn Ile Thr Asp
 20 25 30

Tyr	Ser	Ile	Asn	Ser	Arg	Tyr	Glu	Pro	Lys	Val	Phe	Asp	Cys	Gly	Asp
35						40						45			
Asn	Ile	Val	Met	Ser	Ala	Asn	Gly	Phe	Ala	Ala	Asp	Gly	Asp	Ala	Leu
50						55						60			
Val	Lys	Arg	Phe	Lys	Asn	Ser	Val	Lys	Trp	Tyr	His	Phe	Asp	His	Asn
65						70						75			
Asp	Lys	Lys	Leu	Ser	Ile	Asn	Ser	Ala	Ala	Arg	Asn	Ile	Gln	His	Leu
			85						90			95			
Leu	Tyr	Gly	Lys	Arg	Phe	Phe	Pro	Tyr	Tyr	Val	His	Thr	Ile	Ile	Ala
			100						105			110			
Gly	Leu	Asp	Glu	Asp	Gly	Lys	Gly	Ala	Val	Tyr	Ser	Phe	Asp	Pro	Val
			115						120			125			
Gly	Ser	Tyr	Glu	Arg	Glu	Gln	Cys	Arg	Ala	Gly	Gly	Ala	Ala	Ala	Ser
130						135						140			
Leu	Ile	Met	Pro	Phe	Leu	Asp	Asn	Gln	Val	Asn	Phe	Lys	Asn	Gln	Tyr
145						150						155			
Glu	Pro	Gly	Thr	Asn	Gly	Lys	Val	Lys	Lys	Pro	Leu	Lys	Tyr	Leu	Ser
			165						170			175			
Val	Glu	Glu	Val	Ile	Lys	Leu	Val	Arg	Asp	Ser	Phe	Thr	Ser	Ala	Thr
			180						185			190			
Glu	Arg	His	Ile	Gln	Val	Gly	Asp	Gly	Leu	Glu	Ile	Leu	Ile	Val	Thr
195						200						205			
Lys	Asp	Gly	Val	Arg	Lys	Glu	Phe	Tyr	Glu	Leu	Lys	Arg	Asp		
210						215						220			

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<210> 5
<211> 233
<212> PRT
<213> Saccharomyces cerevisiae
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<400> 5  
Thr Gln Gln Pro Ile Val Thr Gly Thr Ser Val Ile Ser Met Lys Tyr  
   1                               5               10           15  
  
Asp Asn Gly Val Ile Ile Ala Ala Asp Asn Leu Gly Ser Tyr Gly Ser  
                20                   25           30  
  
Leu Leu Arg Phe Asn Gly Val Glu Arg Leu Ile Pro Val Gly Asp Asn  
      35                     40           45  
  
Thr Val Val Gly Ile Ser Gly Asp Ile Ser Asp Met Gln His Ile Glu  
    50                   55           60  
  
Arg Leu Leu Lys Asp Leu Val Thr Glu Asn Ala Tyr Asp Asn Pro Leu  
  65              70             75           80
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Ala Asp Ala Glu Glu Ala Leu Glu Pro Ser Tyr Ile Phe Glu Tyr Leu
85 90 95

Ala Thr Val Met Tyr Gln Arg Arg Ser Lys Met Asn Pro Leu Trp Asn
100 105 110

Ala Ile Ile Val Ala Gly Val Gln Ser Asn Gly Asp Gln Phe Leu Arg
115 120 125

Tyr Val Asn Leu Leu Gly Val Thr Tyr Ser Ser Pro Thr Leu Ala Thr
130 135 140

Gly Phe Gly Ala His Met Ala Asn Pro Leu Leu Arg Lys Val Val Asp
145 150 155 160

Arg Glu Ser Asp Ile Pro Lys Thr Thr Val Gln Val Ala Glu Glu Ala
165 170 175

Ile Val Asn Ala Met Arg Val Leu Tyr Tyr Arg Asp Ala Arg Ser Ser
180 185 190

Arg Asn Phe Ser Leu Ala Ile Ile Asp Lys Asn Thr Gly Leu Thr Phe
195 200 205

Lys Lys Asn Leu Gln Val Glu Asn Met Lys Trp Asp Phe Ala Lys Asp
210 215 220

Ile Lys Gly Tyr Gly Thr Gln Lys Ile
225 230

<210> 6
<211> 232
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 6
Thr Thr Ile Val Gly Val Lys Phe Asn Asn Gly Val Val Ile Ala Ala
1 5 10 15

Asp Thr Arg Ser Thr Gln Gly Pro Ile Val Ala Asp Lys Asn Cys Ala
20 25 30

Lys Leu His Arg Ile Ser Pro Lys Ile Trp Cys Ala Gly Ala Gly Thr
35 40 45

Ala Ala Asp Thr Glu Ala Val Thr Gln Leu Ile Gly Ser Asn Ile Glu
50 55 60

Leu His Ser Leu Tyr Thr Ser Arg Glu Pro Arg Val Val Ser Ala Leu
65 70 75 80

Gln Met Leu Lys Gln His Leu Phe Lys Tyr Gln Gly His Ile Gly Ala
85 90 95

Tyr Leu Ile Val Ala Gly Val Asp Pro Thr Gly Ser His Leu Phe Ser
100 105 110

Ile His Ala His Gly Ser Thr Asp Val Gly Tyr Tyr Leu Ser Leu Gly
 115 120 125
 Ser Gly Ser Leu Ala Ala Met Ala Val Leu Glu Ser His Trp Lys Gln
 130 135 140
 Asp Leu Thr Lys Glu Glu Ala Ile Lys Leu Ala Ser Asp Ala Ile Gln
 145 150 155 160
 Ala Gly Ile Trp Asn Asp Leu Gly Ser Gly Ser Asn Val Asp Val Cys
 165 170 175
 Val Met Glu Ile Gly Lys Asp Ala Glu Tyr Leu Arg Asn Tyr Leu Thr
 180 185 190
 Pro Asn Val Arg Glu Glu Lys Gln Lys Ser Tyr Lys Phe Pro Arg Gly
 195 200 205
 Thr Thr Ala Val Leu Lys Glu Ser Ile Val Asn Ile Cys Asp Ile Gln
 210 215 220
 Glu Glu Gln Val Asp Ile Thr Ala
 225 230

<210> 7
 <211> 234
 <212> PRT
 <213> Homo sapiens

<400> 7
 Thr Thr Ile Ala Gly Leu Val Phe Gln Asp Gly Val Ile Leu Gly Ala
 1 5 10 15
 Asp Thr Arg Ala Thr Asn Asp Ser Val Val Ala Asp Lys Ser Cys Glu
 20 25 30
 Lys Ile His Phe Ile Ala Pro Lys Ile Tyr Cys Cys Gly Ala Gly Val
 35 40 45
 Ala Ala Asp Ala Glu Met Thr Thr Arg Met Val Ala Ser Lys Met Glu
 50 55 60
 Leu His Ala Leu Ser Thr Gly Arg Glu Pro Arg Val Ala Thr Val Thr
 65 70 75 80
 Arg Ile Leu Arg Gln Thr Leu Phe Arg Tyr Gln Gly His Val Gly Ala
 85 90 95
 Ser Leu Ile Val Gly Gly Val Asp Leu Thr Gly Pro Gln Leu Tyr Gly
 100 105 110
 Val His Pro His Gly Ser Tyr Ser Arg Leu Pro Phe Thr Ala Leu Gly
 115 120 125
 Ser Gly Gln Asp Ala Ala Leu Ala Val Leu Glu Asp Arg Phe Gln Pro
 130 135 140

Asn Met Thr Leu Glu Ala Ala Gln Gly Leu Leu Val Glu Ala Val Thr
 145 150 155 160

Ala Gly Ile Leu Gly Asp Leu Gly Ser Gly Gly Asn Val Asp Ala Cys
 165 170 175

Val Ile Thr Lys Thr Gly Ala Lys Leu Leu Arg Thr Leu Ser Ser Pro
 180 185 190

Thr Glu Pro Val Lys Arg Ser Gly Arg Tyr His Phe Val Pro Gly Thr
 195 200 205

Thr Ala Val Leu Thr Gln Thr Val Lys Pro Leu Thr Leu Glu Leu Val
 210 215 220

Glu Glu Thr Val Gln Ala Met Glu Val Glu
 225 230

<210> 8

<211> 212

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 8

Thr Thr Thr Leu Ala Phe Arg Phe Gln Gly Gly Ile Ile Val Ala Val
 1 5 10 15

Asp Ser Arg Ala Thr Ala Gly Asn Trp Val Ala Ser Gln Thr Val Lys
 20 25 30

Lys Val Ile Glu Ile Asn Pro Phe Leu Leu Gly Thr Met Ala Gly Gly
 35 40 45

Ala Ala Asp Cys Gln Phe Trp Glu Thr Trp Leu Gly Ser Gln Cys Arg
 50 55 60

Leu His Glu Leu Arg Glu Lys Glu Arg Ile Ser Val Ala Ala Ala Ser
 65 70 75 80

Lys Ile Leu Ser Asn Leu Val Tyr Gln Tyr Lys Gly Ala Gly Leu Ser
 85 90 95

Met Gly Thr Met Ile Cys Gly Tyr Thr Arg Lys Glu Gly Pro Thr Ile
 100 105 110

Tyr Tyr Val Asp Ser Asp Gly Thr Arg Leu Lys Gly Asp Ile Phe Cys
 115 120 125

Val Gly Ser Gly Gln Thr Phe Ala Tyr Gly Val Leu Asp Ser Asn Tyr
 130 135 140

Lys Trp Asp Leu Ser Val Glu Asp Ala Leu Tyr Leu Gly Lys Arg Ser
 145 150 155 160

Ile Leu Ala Ala Ala His Arg Asp Ala Tyr Ser Gly Gly Ser Val Asn
 165 170 175

Leu Tyr His Val Thr Glu Asp Gly Trp Ile Tyr His Gly Asn His Asp
 180 185 190

Val Gly Glu Leu Phe Trp Lys Val Lys Glu Glu Glu Gly Ser Phe Asn
 195 200 205

Asn Val Ile Gly
 210

<210> 9

<211> 204

<212> PRT

<213> Homo sapiens

<400> 9

Thr Thr Thr Leu Ala Phe Lys Phe Arg His Gly Val Ile Val Ala Ala
 1 5 10 15

Asp Ser Arg Ala Thr Ala Gly Ala Tyr Ile Ala Ser Gln Thr Val Lys
 20 25 30

Lys Val Ile Glu Ile Asn Pro Tyr Leu Leu Gly Thr Met Ala Gly Gly
 35 40 45

Ala Ala Asp Cys Ser Phe Trp Glu Arg Leu Leu Ala Arg Gln Cys Arg
 50 55 60

Ile Tyr Glu Leu Arg Asn Lys Glu Arg Ile Ser Val Ala Ala Ala Ser
 65 70 75 80

Lys Leu Leu Ala Asn Met Val Tyr Gln Tyr Lys Gly Met Gly Leu Ser
 85 90 95

Met Gly Thr Met Ile Cys Gly Trp Asp Lys Arg Gly Pro Gly Leu Tyr
 100 105 110

Tyr Val Asp Ser Glu Gly Asn Arg Ile Ser Gly Ala Thr Phe Ser Val
 115 120 125

Gly Ser Gly Ser Val Tyr Ala Tyr Gly Val Met Asp Arg Gly Tyr Ser
 130 135 140

Tyr Asp Leu Glu Val Glu Gln Ala Tyr Asp Leu Ala Arg Arg Ala Ile
 145 150 155 160

Tyr Gln Ala Thr Tyr Arg Asp Ala Tyr Ser Gly Gly Ala Val Asn Leu
 165 170 175

Tyr His Val Arg Glu Asp Gly Trp Ile Arg Val Ser Ser Asp Asn Val
 180 185 190

Ala Asp Leu His Glu Lys Tyr Ser Gly Ser Thr Pro
 195 200

<210> 10
 <211> 204
 <212> PRT
 <213> Homo sapiens

<400> 10
 Thr Thr Thr Leu Ala Phe Lys Phe Gln His Gly Val Ile Ala Ala Val
 1 5 10 15
 Asp Ser Arg Ala Ser Ala Gly Ser Tyr Ile Ser Ala Leu Arg Val Asn
 20 25 30
 Lys Val Ile Glu Ile Asn Pro Tyr Leu Leu Gly Thr Met Ser Gly Cys
 35 40 45
 Ala Ala Asp Cys Gln Tyr Trp Glu Arg Leu Leu Ala Lys Glu Cys Arg
 50 55 60
 Leu Tyr Tyr Leu Arg Asn Gly Glu Arg Ile Ser Val Ser Ala Ala Ser
 65 70 75 80
 Lys Leu Leu Ser Asn Met Met Cys Gln Tyr Arg Gly Met Gly Leu Ser
 85 90 95
 Met Gly Ser Met Ile Cys Gly Trp Asp Lys Lys Gly Pro Gly Leu Tyr
 100 105 110
 Tyr Val Asp Glu His Gly Thr Arg Leu Ser Gly Asn Met Phe Ser Thr
 115 120 125
 Gly Ser Gly Asn Thr Tyr Ala Tyr Gly Val Met Asp Ser Gly Tyr Arg
 130 135 140
 Pro Asn Leu Ser Pro Glu Glu Ala Tyr Asp Leu Gly Arg Arg Ala Ile
 145 150 155 160
 Ala Tyr Ala Thr His Arg Asp Ser Tyr Ser Gly Gly Val Val Asn Met
 165 170 175
 Tyr His Met Lys Glu Asp Gly Trp Val Lys Val Glu Ser Thr Asp Val
 180 185 190
 Ser Asp Leu Leu His Gln Tyr Arg Glu Ala Asn Gln
 195 200

<210> 11
 <211> 196
 <212> PRT
 <213> Saccharomyces cerevisiae

<400> 11
 Thr Ser Ile Met Ala Val Thr Phe Lys Asp Gly Val Ile Leu Gly Ala
 1 5 10 15
 Asp Ser Arg Thr Thr Thr Gly Ala Tyr Ile Ala Asn Arg Val Thr Asp
 20 25 30

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<210> 12
<211> 205
<212> PRT
<213> Homo sapiens
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<400> 12
Thr Thr Ile Met Ala Val Gln Phe Asp Gly Gly Val Val Leu Gly Ala
  1          5          10          15
Asp Ser Arg Thr Thr Thr Gly Ser Tyr Ile Ala Asn Arg Val Thr Asp
          20          25          30
Lys Leu Thr Pro Ile His Asp Arg Ile Phe Cys Cys Arg Ser Gly Ser
          35          40          45
Ala Ala Asp Thr Gln Ala Val Ala Asp Ala Val Thr Tyr Gln Leu Gly
  50          55          60
Phe His Ser Ile Glu Leu Asn Glu Pro Pro Leu Val His Thr Ala Ala
  65          70          75          80
Ser Leu Phe Lys Glu Met Cys Tyr Arg Tyr Arg Glu Asp Leu Met Ala
          85          90          95

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Gly Ile Ile Ile Ala Gly Trp Asp Pro Gln Glu Gly Gly Gln Gly Tyr
 100 105 110
 Ser Val Pro Met Gly Gly Met Met Val Arg Gln Ser Phe Ala Ile Gly
 115 120 125
 Gly Ser Gly Ser Ser Tyr Ile Tyr Gly Tyr Val Asp Ala Thr Tyr Arg
 130 135 140
 Glu Gly Met Thr Lys Glu Glu Cys Leu Gln Phe Thr Ala Asn Ala Leu
 145 150 155 160
 Ala Leu Ala Met Glu Arg Asp Gly Ser Ser Gly Gly Val Ile Arg Leu
 165 170 175
 Ala Ala Ile Ala Glu Ser Gly Val Glu Arg Gln Val Leu Leu Gly Asp
 180 185 190
 Gln Ile Pro Lys Phe Ala Val Ala Thr Leu Pro Pro Ala
 195 200 205

<210> 13
 <211> 199
 <212> PRT
 <213> Homo sapiens

<400> 13
 Thr Thr Ile Met Ala Val Glu Phe Asp Gly Gly Val Val Met Gly Ser
 1 5 10 15
 Asp Ser Arg Val Ser Ala Gly Glu Ala Val Val Asn Arg Val Phe Asp
 20 25 30
 Lys Leu Ser Pro Leu His Glu Arg Ile Tyr Cys Ala Leu Ser Gly Ser
 35 40 45
 Ala Ala Asp Ala Gln Ala Val Ala Asp Met Ala Ala Tyr Gln Leu Glu
 50 55 60
 Leu His Gly Ile Glu Leu Glu Glu Pro Pro Leu Val Leu Ala Ala Ala
 65 70 75 80
 Asn Val Val Arg Asn Ile Ser Tyr Lys Tyr Arg Glu Asp Leu Ser Ala
 85 90 95
 His Leu Met Val Ala Gly Trp Asp Gln Arg Glu Gly Gly Gln Val Tyr
 100 105 110
 Gly Thr Leu Gly Gly Met Leu Thr Arg Gln Pro Phe Ala Ile Gly Gly
 115 120 125
 Ser Gly Ser Thr Phe Ile Tyr Gly Tyr Val Asp Ala Ala Tyr Lys Pro
 130 135 140
 Gly Met Ser Pro Glu Glu Cys Arg Arg Phe Thr Thr Asp Ala Ile Ala
 145 150 155 160

Leu Ala Met Ser Arg Asp Gly Ser Ser Gly Gly Val Ile Tyr Leu Val
 165 170 175

Thr Ile Thr Ala Ala Gly Val Asp His Arg Val Ile Leu Gly Asn Glu
 180 185 190

Leu Pro Lys Phe Tyr Asp Glu
 195

<210> 14

<211> 4

<212> PRT

<213> Thermoplasma acidophilum

<400> 14

Tyr Gly Gly Val

1